CHOOSING OUR FUTURE

AN INVITATION TO REVITALIZE GREATER VANCOUVER'S LIVABLE REGION STRATEGY

Living Close to Work

Greater Vancouver Regional District
May 1990

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LIVING CLOSE TO WORK
A POLICY REVIEW

Prepared For

DEVELOPMENT SERVICES DEPARTMENT
GREATER VANCOUVER REGIONAL DISTRICT

By

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May 1990

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EXECUTIVE SUMMARY

The focus of this study, which is part of the Greater Vancouver Regional District's "Choosing Our Future" program, is a review of the "Living Close to Work" strategy. In particular, the main questions to be answered are: Did the policy achieve the objectives set in the seventies? Should the policy be continued?

Background

The Livable Region Plan, created in the early 1970's, was a strategy developed by the Greater Vancouver Regional District (GVRD) in response to the rapid population growth occurring at the time. The Plan, which incorporated the views of the region's inhabitants regarding their residential location, was designed to manage and direct this significant growth in order to provide a Livable Region. An objective of the Livable Region Strategy was to increase the potential for people to live close to work, or work close to home, thereby reducing the growth of long distance commuting. This objective was adopted at a time, in the early 1970's, when 80 percent of commuters had a journey to work time of less than 45 minutes and wanted that time reduced. While the "Living Close to Work" strategy was adopted, the criteria by which the success of the objective could be measured were not specified.

Elements of Living Close to work

Traditional transportation planning techniques do not directly address the elements which influence the decision of living close to work. Recent analytical models of urban travel have shown that elements, such as the cost of housing, the level of employment, the size of the labour force, income and cost of travel, may be combined to influence the house location choice. The models indicate that, in order to maintain a constant average trip length distribution in the region, the growth of employment and labour force should be kept in balance. Also, the cost of housing for locations close and distant relative to the Central Business District (CBD) should be similar. Finally, the relative cost of transportation for the various zones should be kept similar.

The relationship of these major elements is shown in FIGURE S.1 as a set of partially overlapping circles. Each circle represents an area of policy related to employment, labour force, transportation cost and housing costs. An effective living close to work policy will require the four elements to be compatible. This is shown by the dark shaded area. The current GVRD "Living Close to Work Policy", identified by the lightly shaded area, involves only labour force and employment.

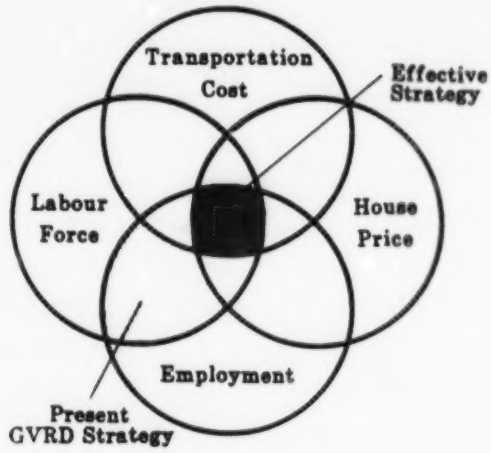

FIGURE S.1 MAJOR ELEMENTS OF "LIVING CLOSE TO WORK" STRATEGY

Measures of Living Close to Work

The first set of measures is the ratio of jobs to labour force by area and the average journey to work travel time. Results of the analysis of this ratio and travel time indicated that the present "Living Close to Work" strategy has been ineffective. Similar results were obtained upon analysis of the change in the proportion of internal work trips per zone.

The second set of measures is housing price. Changes in housing cost will indicate whether strong economic forces counteract the employment to labour force balance policy. Results of the analysis indicated that housing prices had risen the most in zones of job concentration. This is a trend that contradicts the "Living Close to Work" strategy.

Land Use Trends

Between the years 1971 and 1986, Vancouver has retained the largest share of the population within the metropolitan region, however, this share has declined from 40 percent to 32 percent. The suburbs located farthest away from Vancouver have the greatest percentage increase of population averaging approximately 80 percent over the period. Regions whose population increased in absolute numbers also experienced a similar increase in their resident labour force.

Since the early 1970's, Vancouver has remained the largest employment centre within the metropolitan region with about 46 percent of the 635,000 jobs. A comparison of the percentage employment growth within each zone of the metropolitan region reveals that on a percentage basis, the zones located farthest away from the CBD of Vancouver have shown the greatest rate of increase in jobs. In absolute terms, the additional 74,000 jobs in Vancouver was the greatest increase.

The net result is that jobs are becoming more concentrated in Vancouver, Burnaby and Richmond when measured by the ratio of employed labour force to resident labour force. Also, Surrey has experienced a significant improvement in the ratio of employment to labour force but still is about 40 percent away from a balance of jobs and labour force. The one area that has not improved its employment to labour force ratio is the North East Sector of Coquitlam, Port Coquitlam and Port Moody. On the whole, there have been only minor improvements in the balance of employment to labour force within the GVRD. Based on land use trends, the "Living Close to Work" strategy has been ineffective.

Transportation Trends

Between the period of 1974 and 1987, the average travel time for work-trips in the metropolitan region has generally remained the same at between 20 and 24 minutes. The constant travel time implies that people have generally maintained their relative location to employment.

Viewed another way, there has been a significant reduction in the fraction of work trips that remain internal to a municipality. The changes range between 25 percent for New Westminster to ten percent for Vancouver and a modest three percent increase for Richmond. Port Moody and Maple Ridge have also experienced a 15 percent increase in external commuting. Overall, there has been approximately a five percent increase in work trips beyond the municipal boundary. This implies that people may be travelling a slightly further distance on their journey to work.

The constant travel time and slightly increased outflow of traffic from municipalities is considered to be a rough indication that people have chosen a locational balance between jobs and housing that is similar to that of the early 1970's. The reasons for the unchanged travel time can be attributed to the improvements and expansions to the transportation network and services which have taken place in the past two decades, along with the increase in suburban-to-suburban trips and reverse commuting from Vancouver. The outbound or reverse commuter traffic has increased about twice as fast as the inbound traffic. Based on the transportation trends, the "Living Close to Work" strategy has been ineffective.

Socioeconomic Factors Affecting "Living Close to Work"

Research has revealed that living close to work is influenced by housing costs as well as job availability and travel cost. Housing costs during the past two decades increased faster in areas where most of the metropolitan region's jobs are located, such as Vancouver, Burnaby and Richmond.

Results of the analysis of housing ownership affordability measured by the ratio of household income to housing costs reveals an imbalance in most locations of the region. This imbalance is greatest in the Vancouver area, New Westminster and White Rock. The temporal variation in affordability shows that the problem areas for job-to-housing balance appear to be around Vancouver's CBD, rather than in the newly developing areas.

It has been found that while jobs are created in the City of Vancouver and adjacent suburbs, more housing is being created in the outlying suburbs. Considering that the employment zones of Vancouver, Richmond, Surrey and Burnaby cater to more than 70 percent of the region's jobs, the need for additional affordable housing developments in these zones exists.

Finally, research has revealed that household sizes at the urban fringe are generally larger than those in Vancouver and adjacent areas which leaves unanswered the whole issue of life style. This finding may indicate that larger size households may not have as strong a preference to living close to their place of work as smaller households.

Conclusion

It is difficult to assess if the policy of living close to work has succeeded because criteria are difficult to define and measure, in part because the society of the 1980's is considerably different from that of the 1970's when the policy was adopted.

The reasonably constant employment to labour force ratio and average travel time indicate that the policy has been generally ineffective. The land use and transportation data available indicate trends that have changed insignificantly since the 1970's. The data implies that housing costs are more important in the location decision than local job availability or the actual cost of travel. The greatest housing cost increase is in Vancouver, the same location with the greatest absolute employment increase.

The GVRD policy to decentralize jobs to zones outside of Vancouver should be maintained. However, the "Living Close to Work" strategy needs to consider the four major elements shown in FIGURE S.1. For this strategy to succeed, these elements need to interact in the following manner:

- Affordable housing costs in all regions.
- Decentralization of employment opportunities with compatible labour force distribution.
- A transportation network providing efficient accessibility and mobility at an affordable cost.

The GVRD's policy of encouraging jobs to labour force balance is desirable, as it helps in promoting growth in all regions while also reducing the total distances travelled. Increasing the proportion of workers who live close to their jobs also has an impact on creating an environmentally sustainable and livable community. Greater Vancouver's air quality, for instance, can be improved if less vehicle miles are travelled. Reducing the amount of time that private vehicles are used as a result of workers living close to their jobs can have a positive effect. The policy needs to be broadened, however, in order to include all four major elements shown in FIGURE S.1. The policy considerations are summarized below:

1. A policy aimed at creating a locational balance between employment and residential activities should be based on measurable criteria, such as average travel time between place of residence and place of work, or the geographical distance between the two; for living close to work may have different interpretations for different categories of people because of the variations in their household characteristics.

2. A balance between housing cost and household income is an important consideration for the "Living Close to Work" strategy. A suitable policy to regulate housing cost may be an effective tool for creating this balance but would be difficult to achieve because of free market conditions. However, affordable housing should be encouraged in high employment areas, thereby increasing the opportunities for a jobs to labour force balance.

3. The continued development of a transportation system providing region-wide accessibility and mobility at an affordable cost should be encouraged.

4. Regional districts adjacent to the GVRD should be encouraged to adopt a similar "Living Close to Work" strategy based on the above considerations in order to ensure smooth and efficient interfacing between themselves and the GVRD.

1.0 INTRODUCTION

1.1 Background

In the early 1970's, the population of the Greater Vancouver Region was growing at a rapid rate and the prospect of this population magnifying to twice its size by the turn of the century was of great concern. In an effort to manage this significant growth, the municipalities of the Greater Vancouver Region held public meetings in order to ascertain what residents liked or disliked about their residential location. This extensive public involvement resulted in a Strategy, referred to as the "Livable Region Plan", which strived "to manage growth and change so as to maintain or enhance the livability of the Region"(11). The implementation actions for this Strategy were adopted by the Greater Vancouver Regional District (GVRD) Board in 1975. Since that time, the strategy has served as a broad vision for the region's future development and a framework for developing rapid transit, building regional town centres, and improving environmental quality.

The Livable Region Plan is based on the maintenance or enhancement of a number of broad livability goals for the Greater Vancouver Region into the future. The Plan consists of five elements with the objective of providing the most effective means of managing and directing growth to enhance the Region's livability. The five elements of this Strategy are as follows:

1. The protection of Greater Vancouver's natural environment.

2. The provision of the necessary infrastructure and services to develop a healthy regional economy.

3. The development of regional town centres.

4. The provision of transit-oriented transportation systems.

5. The improvement of accessibility for people and goods through achieving a job to labour force balance in all parts of the Greater Vancouver area.

As part of the Livable Region Plan, the strategy of encouraging a balance between jobs and population was adopted. This strategy aimed to set residential growth targets in each municipality so that the overall future growth of the Region would be shared among all the municipalities on a rational basis. A balance of jobs-to-population was promoted in each municipality so that areas which had a "surplus" of jobs over workers in the 1970's would encourage decentralization of jobs to other areas. Regions which demonstrated a "surplus" of workers over jobs would be encouraged to attract or create more jobs. It was hoped that these population and employment targets would be incorporated into the Official Community Plans of the respective municipalities, and thus, implementation measures could be achieved through municipal mechanisms such as zoning and development permit applications. The objective of achieving these job-to-population targets would be the reduction of people's need to travel long distances to work and the increase of choices of places where they can both live and work.

This strategy promoted the development of Regional Town Centres in suburban locations so that more jobs, in addition to commercial and cultural opportunities, would be provided closer to where people live. It was hoped that newly - created jobs and jobs located in the Central Business District of Vancouver would locate in these Regional Town Centres thus enabling workers who were living in a suburban municipality to spend less time travelling to work.

Since the conception of the Livable Region Plan, the Greater Vancouver Region has evolved considerably. Although many of the Plan's forecasts for the future of the Region have actually transpired, other expectations have not occurred to the extent predicted. The fundamental directions underlying the original Plan, therefore, are being analyzed in an effort to "Choose Our Future" in the 1990's. This paper serves as part of the general considerations for the establishment of a Livable Region Strategy for the 1990's.

1.2 Study Focus

The study focuses on the strategy aimed at achieving a jobs to labour force balance in all parts of the Greater Vancouver Region. In the early 1970's, 80 percent of the people working in the Region reported their travel time to work to be within 45 minutes (11). These individuals, however, wanted to reduce the time and effort involved in travelling to work. An objective of the Livable Region Strategy was to increase the potential for people to live close to work (or work close to home) thereby reducing the growth of longer distance commuting.

Although the concept of "Living Close to Work" is only one element within the Livable Region's five-part strategy, all the elements put in effect together play a role in improving the accessibility of the region. "The proposals of the Livable Region Plan for population targets, for jobs-to-population balance, and for Regional Town Centres were all made to help achieve a better balance between the jobs available in major parts of the Region and the number of workers who live there in order that everyone would have a better opportunity to live close to their workplace"(11).

The purpose of this research paper is to evaluate the success of the "Living Close to Work" concept in order to determine whether it continues to be appropriate for the Greater Vancouver Region in the future.

1.3 Study Terms of Reference

The terms of reference of the study are as follows:

1. To provide an overview of the current place of residence versus the place of work situation in the Vancouver CMA.

2. To evaluate the "Living Close to Work" Strategy based on changes in the place of residence versus the place of work situation since the early 1970's.

3. To specify certain factors which should be considered in the evaluation of the regional development policy promoted by the Livable Region Plan.

1.4 Scope of the Study

The scope of the study includes the review of available statistics for the Greater Vancouver Region. The geographical and temporal scope of the study is outlined below.

A. Geographical Context

The geographical context of this study consists of the Vancouver Census Metropolitan Area (CMA), with the exception of the Villages of Lions Bay, Anmore and Belcarra, and Electoral Areas B and C. The Vancouver CMA is comprised of the member municipalities which make up the Greater Vancouver Regional District, along with the municipalities of Maple Ridge and Pitt Meadows.

The Vancouver CMA, rather than the Greater Vancouver Regional District (GVRD), was used for the purpose of this study since most of the available statistical data was presented for the larger Vancouver CMA. In order to better identify the patterns and trends in land-use and travel characteristics, the statistical data employed in this study was condensed into 12 zones incorporating the municipalities of the Vancouver CMA, with the exceptions noted previously. The twelve zones employed in the research are as follows:

Zone 1. Vancouver (including the central business district) and the University Endowment Lands (VAN).
Zone 2. West Vancouver (W.V).

Zone 3.	North Vancouver City and District (N.V).
Zone 4.	Burnaby (BBY).
Zone 5.	Richmond (RMD).
Zone 6.	New Westminster (N.W).
Zone 7.	Delta (DEL).
Zone 8.	Coquitlam, Port Coquitlam and Port Moody (COQ).
Zone 9.	Surrey (SRY).
Zone 10.	Pitt Meadows and Maple Ridge (P.M)
Zone 11.	White Rock (W.R).
Zone 12.	Langley City and District (LGY).

B. Time Period of 1971 to 1986

A 15 year time period between 1971 and 1986 has been selected for the study because:

1. The study concentrated on an analysis of the period from the early 1970's prior to the implementation of the Livable Region Plan. The year 1986 was used as the terminating point for examination since it is the year of the most recent census data.

2. A period of 15 years was used in order to present the cyclical changes in demographic trends over this period of time. It was decided that highlighting the 1981 trends would distort the findings since 1981 was an exceptionally prosperous year immediately before the recessionary period of the mid 1980s.

1.5 Study Approach and Methodology

A systematic approach was employed to evaluate the success of the Livable Region's "Living Close to Work" strategy. The study measured the success of this strategy in two ways. The first measure is the change in the number of people living and working in the same zone, while the second measure is the change in the average work trip travel time within the Vancouver Metropolitan Area. The study consisted of the following four phases:

Phase 1. Review of existing literature and research studies.

Phase 2. Review of land use planning trends.

Phase 3. Review of transportation planning trends.

Phase 4. Review of socioeconomic trends.

These reviews, individually and collectively, were used to measure the success of the "Living Close to Work" strategy.

1.6 Reference Materials

The reports and information which were reviewed for the purpose of this study are listed in APPENDIX I.

Population, employment and labour force statistics used in the study were obtained from the GVRD Development Services document, Greater Vancouver Key Facts - A Statistical Profile of Greater Vancouver, Canada, while the socioeconomic data was obtained from Statistics Canada. The transportation data was derived from the Greater Vancouver Development Services Technical Memorandum titled, Vancouver Metropolitan Area: Place of Work and Place of Residence, 1971 and 1981 - Data and Analysis, along with the GVRD's 1985 Metropolitan Vancouver Origin-Destination Study.

2.0 LAND-USE TRENDS

This section reviews the regional population, employment, and labour force growth within the context of the living close to work relationship. Analysis of the change in these land use indicators within the Vancouver metropolitan area between 1971 and 1986 reveals the zones which have experienced growth over this time relative to their distance from the Vancouver CBD, and highlights the general distribution patterns across the region.

2.1 Population Distribution Trends

Over the time period between 1971 and 1986, there has been a changing zonal distribution of population within the Vancouver CMA. As FIGURES 2.1 and 2.2 illustrate, Vancouver, the North Shore, Burnaby and New Westminster all experienced a decrease in their relative share of the region's total population. Although Vancouver's share of the regional population remained the highest, it also experienced the greatest decline in its share (8.0 percent) between 1971 and 1986 due to the population growth of the outlying suburbs.

The zones which experienced a faster growth in population than the region as a whole were the suburbs located farthest away from Vancouver. Langley, Surrey, Richmond and Delta experienced the highest rates of population growth. As FIGURE 2.3 illustrates, the population of the Langleys increased by 163 percent during this time period, while the populations of Surrey, Richmond, and Delta increased by 84 percent, 75 percent and 74 percent, respectively. Surrey and the Langleys demonstrated the greatest increase in their relative share of the total population. Surrey's share increased by 4.1 percent, while the Langleys' share of the population increased by 2.6 percent.

As illustrated in FIGURES 2.3 and 2.4, both the absolute and percentage changes in population for zones within the Vancouver metropolitan region demonstrate a decentralization of population between the years 1971 and 1986. Zones farther from the City of Vancouver show the greatest population increases. In absolute numbers, the population of Vancouver increased by approximately 5,000 between 1971 and 1986, a percentage increase of 1.2 percent. In general, the population of the other zones within the metropolitan area have increased in greater numbers. While Vancouver remains the largest population centre within the metropolitan area, its primacy is being reduced by the population growth of the outlying suburbs. The preferred residential option for a greater number of households has therefore become the suburban areas of the metropolitan region.

2.2 Labour Force Distribution Trends

The changes in the labour force trend during the 1971 to 1986 time period were reviewed in conjunction with the population trend described above, since the place of residence of the region's labour force is dependent upon the decentralization of population. An analysis of the labour force trend between the 1971 and 1986 period revealed the changes which had occurred in the residential component of the "Living Close to Work" relationship.

As FIGURE 2.5 illustrates, most of the zones within the Vancouver metropolitan area whose population increased in absolute numbers between 1971 and 1986 experienced a similar increase in their resident labour force. All these zones with the exception of Vancouver showed a similarly significant increase in their population over this time period. In absolute numbers, the most rapid growth in resident labour force occurred in Surrey, Vancouver and Richmond. An analysis of the percentage change in resident labour force, shown in FIGURE 2.6, reveals that the highest rate of labour force growth had occurred in the suburbs farthest from Vancouver.

A comparison of the absolute population and labour force changes within Vancouver reveals a discrepancy between them. The population of Vancouver had increased by approximately 5,000 persons between 1971 and 1986, while its resident labour force grew by approximately 38,000 persons. This difference between growth in resident labour force and population could be explained in part by the increased female labour force participation rate during this 15 year period. Fifty-seven percent of the absolute increase in Vancouver's resident labour force during this period can be attributed to the increased female members of the labour force. The details of the analysis is shown in APPENDIX II.

2.3 Employment Distribution Trends

The growth in employment in the Vancouver CMA, and the employment to labour force ratio in each zone, are reviewed in this section.

The percentage growth in employment between the years 1971 and 1986 has been greatest in zones located south of the Fraser River, the North East Sector, and the Langleys. As FIGURE 2.7 illustrates, the Langleys and Surrey show the greatest percentage growth in jobs over this time period, while Richmond, Delta, and the Coquitlam area also show considerable percentage increases in employment, although to a lesser extent. The smallest percentage increase in employment was experienced in New Westminster with Vancouver showing the next smallest percentage increase in jobs.

It is noted in FIGURE 2.7 that the percentage changes in employment do not necessarily correspond with the changes in labour force for each zone. For example, although Surrey and the Langleys experienced a greater percentage increase in employment than in their resident labour force, Delta, Pitt Meadows, Maple Ridge and White Rock all experienced a greater growth in their resident labour force in relation to their growth in jobs. This uneven relationship appears to indicate that a worker's choice of residential location is independent of the existence of a job within the same municipality. It is evident that other socio-economic factors are involved in choice of residence and employment.

When the absolute increases in employment between the years 1971 and 1986 are considered, Vancouver has remained the largest employment centre within the metropolitan region. As a comparison between FIGURES 2.7 and 2.8 illustrates, although Vancouver's percentage increase in employment during this period was approximately 30 percent, because of the City's large employment base, this percentage increase represents an addition of 74,000 jobs.

The 74,000 additional jobs generated in Vancouver between the years 1971 and 1986 represent 32 percent of the total jobs created in the metropolitan region during this time period. As FIGURE 2.8 illustrates, the other significant employment centres in the Vancouver CMA during this period were Surrey, Richmond and Burnaby. Jointly, these three zones accounted for 40 percent of the jobs created.

FIGURE 2.9 illustrates a measure of the balance between the employed labour force and the resident labour force within each zone. This may be a preferable indicator of employment change across the region compared to the percentage growth in employment since it demonstrates the job to housing balance.

Between the years 1971 and 1986, the average ratio of employed labour force to resident labour force within the Vancouver CMA was found to be 0.8. As FIGURE 2.9 demonstrates, the zones of Vancouver, Burnaby, and Richmond had a ratio greater than this average for both 1971 and 1986. It is evident that jobs have become more concentrated within Vancouver and its surrounding municipalities since Vancouver and the zones located in proximity to the City have shown an increase in the ratio of employed to resident labour force. The rate of employment growth within each of these zones has been greater than the rate of growth of the resident labour force. For zones located farther from the CBD, no consistent pattern is evident.

2.4 Conclusion

The results of the review of population, labour force and employment trends in the Vancouver CMA region indicated that the population and labour force have increased substantially in the areas farthest from the Vancouver zone, while employment opportunities increased mostly in the Vancouver zone. The population trends and employment to labour force ratios indicate that the "Living Close to Work" strategy has been ineffective.

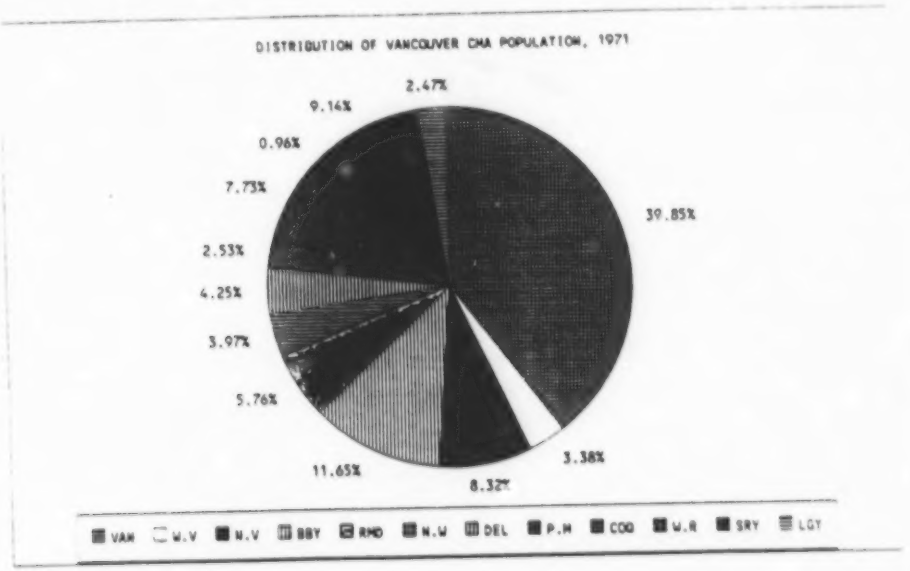

FIGURE 2.1 DISTRIBUTION OF VANCOUVER CMA POPULATION, 1971

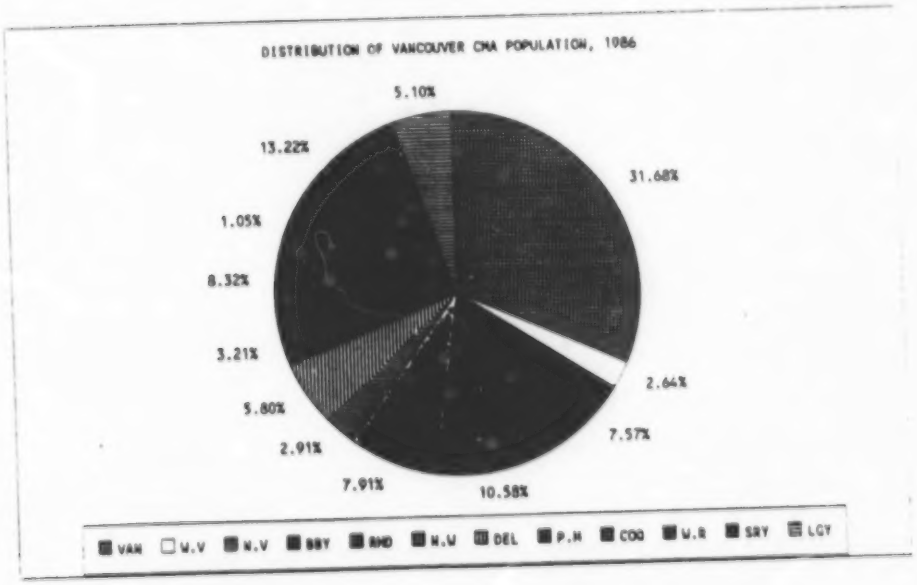

FIGURE 2.2 DISTRIBUTION OF VANCOUVER CMA POPULATION, 1986

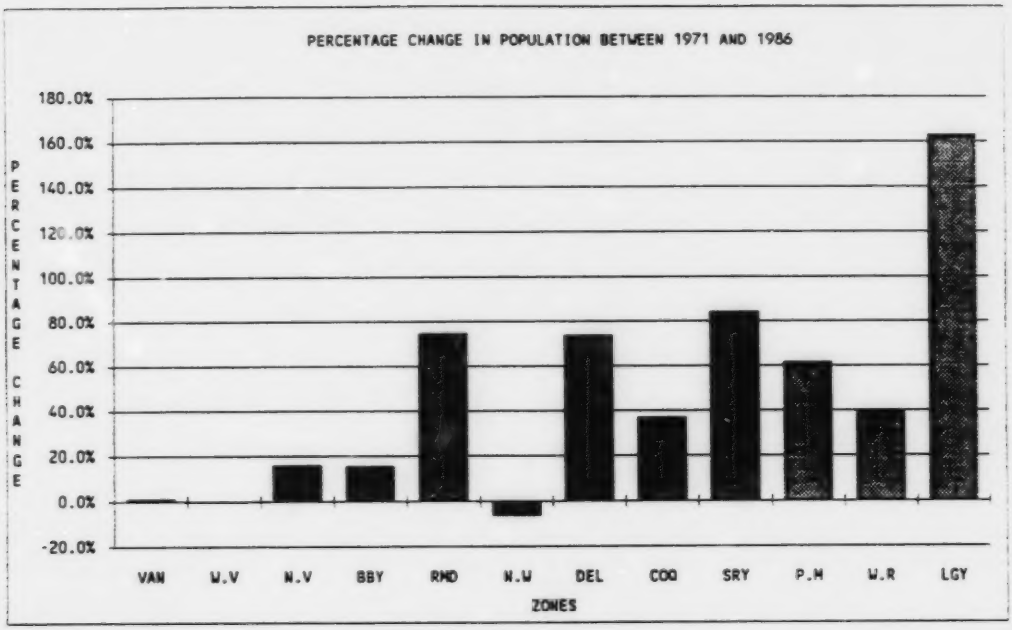

FIGURE 2.3 PERCENTAGE CHANGE IN POPULATION BETWEEN 1971 AND 1986

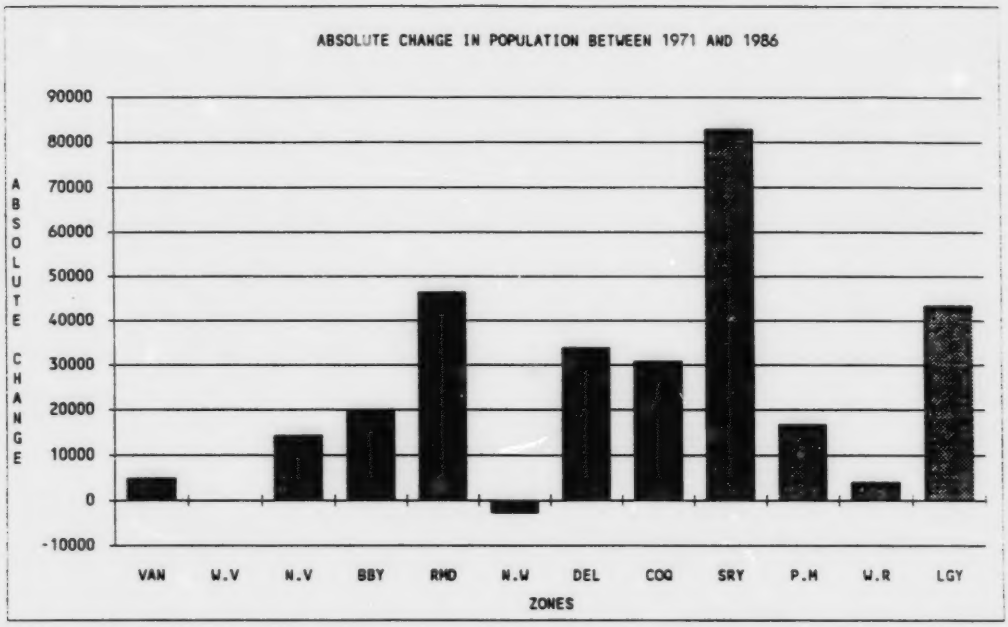

FIGURE 2.4 ABSOLUTE CHANGE IN POPULATION BETWEEN 1971 AND 1986 .

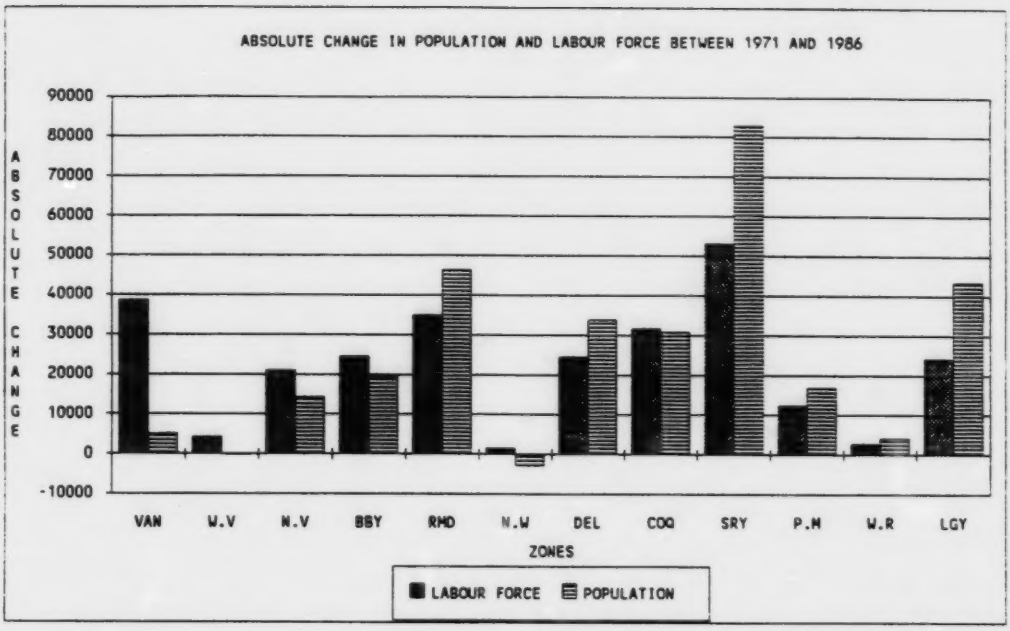

FIGURE 2.5 ABSOLUTE CHANGE IN POPULATION AND LABOUR FORCE BETWEEN 1971 AND 1986

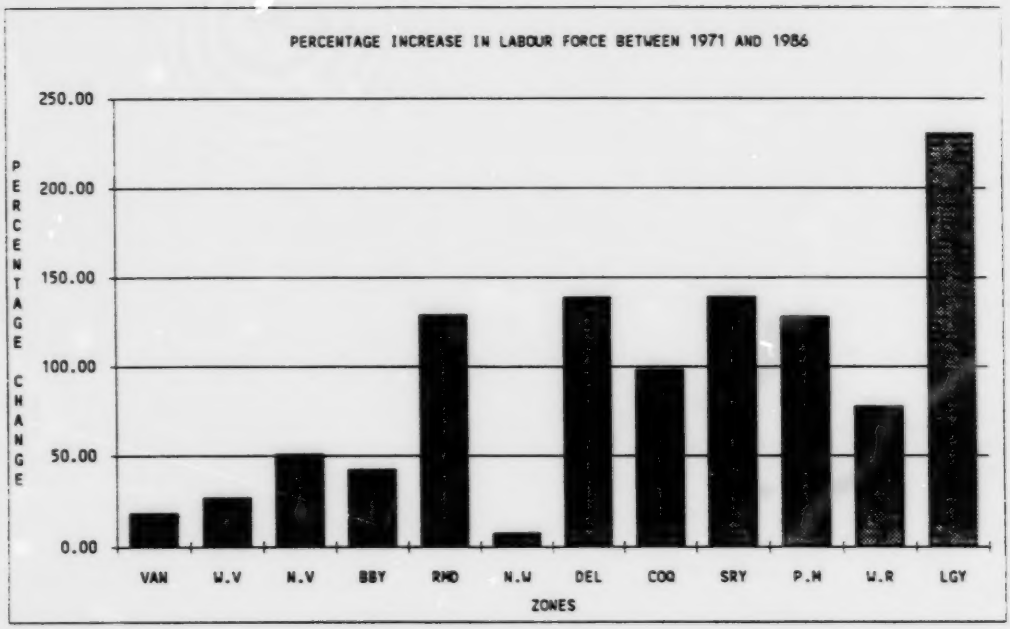

FIGURE 2.6 PERCENTAGE INCREASE IN LABOUR FORCE BETWEEN 1971 AND 1986

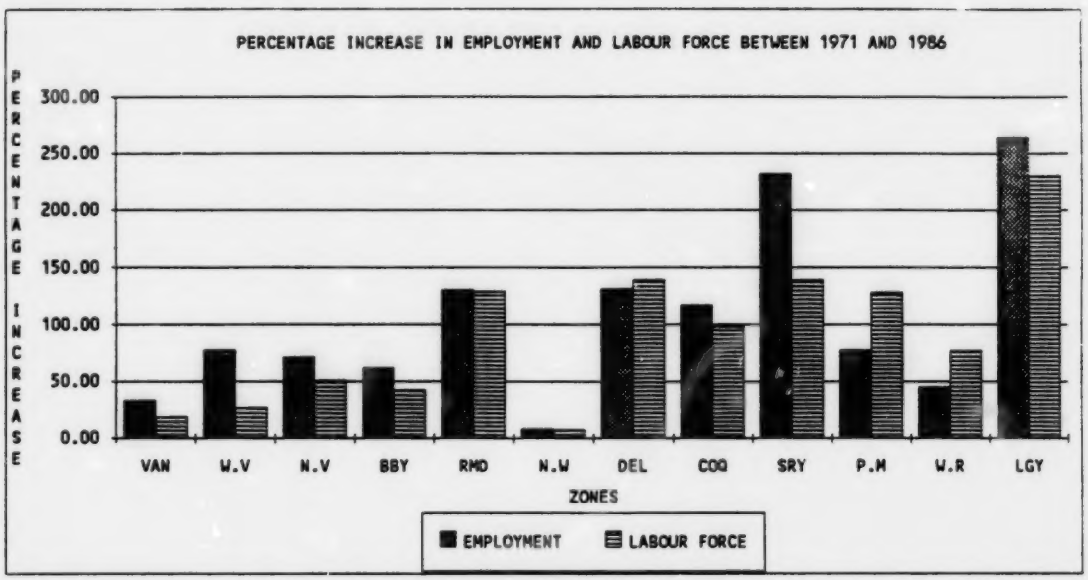

FIGURE 2.7 PERCENTAGE CHANGE IN EMPLOYMENT AND LABOUR FORCE BETWEEN 1971 AND 1986

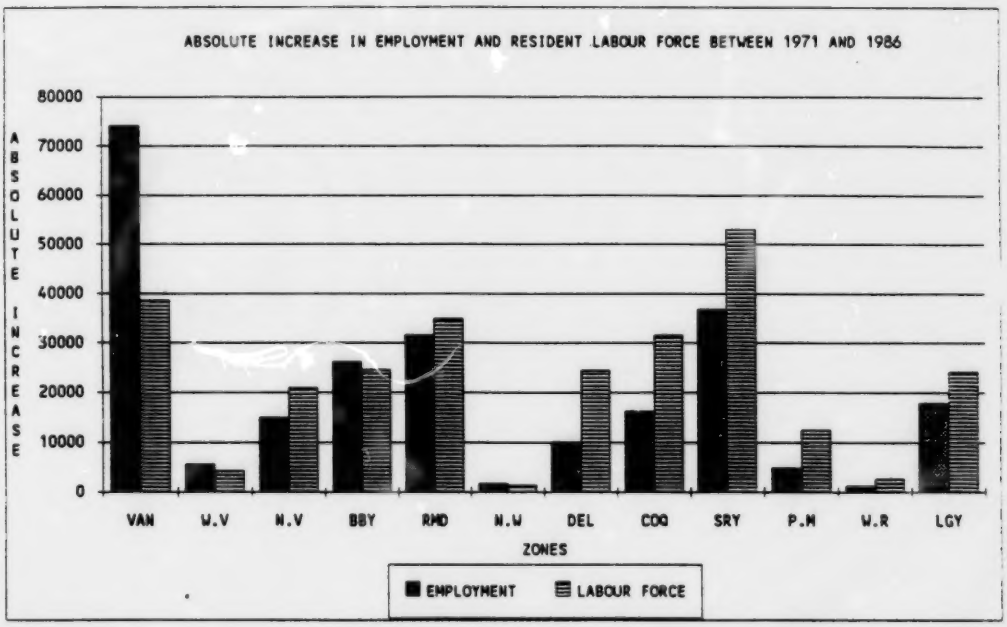

FIGURE 2.8 ABSOLUTE INCREASE IN EMPLOYMENT AND RESIDENT LABOUR FORCE BETWEEN 1971 AND 1986

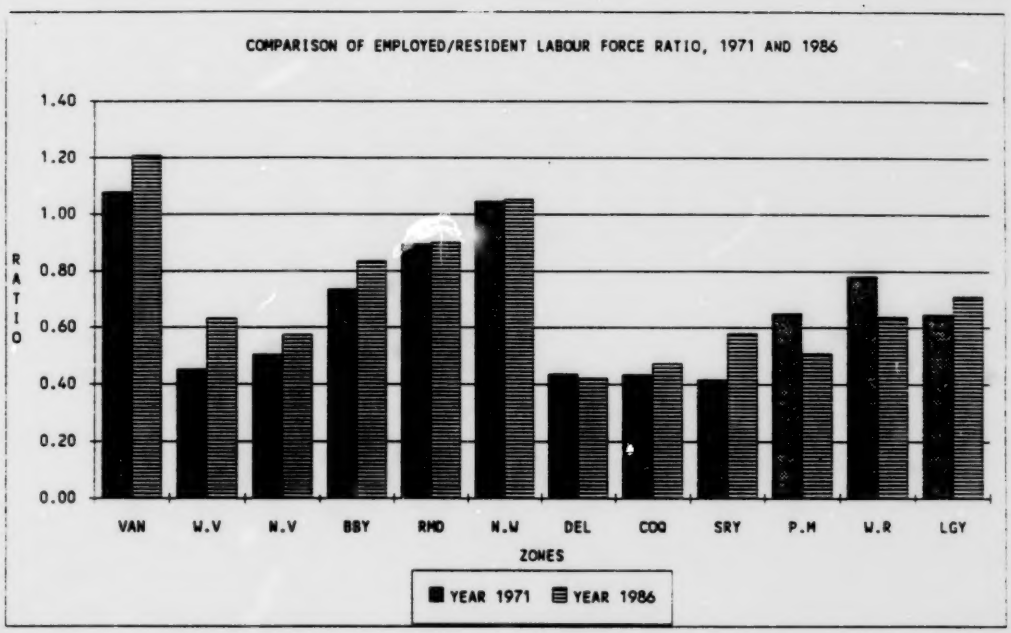

FIGURE 2.9 COMPARISON OF EMPLOYED/RESIDENT LABOUR FORCE RATIO, 1971 AND 1986

3.0 TRANSPORTATION TRENDS

Transportation is an important consideration for a strategy designed to bring about a locational balance between employment and residential activities. The physical proximity between jobs and housing can be measured by travel time. This section will highlight the transportation implications for the "Living Close to Work" strategy in the Vancouver CMA region.

3.1 Measuring "Living Close to Work"

Two transportation measures could be used to define living close to work. One of the usually held measures of separation between employment and housing is the average travel time between the two. According to this measure, a locational balance between jobs and housing is achieved when this average travel time is reduced.

The other measure of living close to work is given by the volume of work trips between the origin and destination zones. In this regard, the variations in the proportion of the labour force living and working in the same area would provide an indication of the decentralization of place of residence and place of work. These measures can be compared between two time periods to evaluate the success of the "Living Close to Work" strategy.

3.2 Average Work Trip Travel Time

This section analyzes the proximity between the place of residence and the place of work in the Vancouver CMA region. Using the 1974 Vancouver Activity Travel Study (VATS, 19) and the GVRD 1985 Origin-Destination Survey(4,5 & 6), the average work trip travel time was analyzed and found to have remained relatively unchanged in the region between the mid-seventies and the late eighties. The average work trip travel time of between 20 and 25 minutes has not significantly changed during this time period. FIGURES 3.1, 3.2 and 3.3 summarize these findings. The general stability in the average travel time during this period indicates that the closeness between the places of residence and the places of work had remained approximately the same in temporal terms.

It is noted that the methodology and surveying techniques used to obtain the 1974 VATS results are not comparable with the GVRD's 1985 study; however, the VATS data is the only available region-wide travel time information in the mid-seventies. It is also noted that the 1974 data is for all modes while the GVRD data is for automobiles alone. The average work trip travel time comparisons between the mid-seventies and the late eighties should therefore be taken as indicators, rather than accurate measures.

The average travel time for work trips within the Vancouver CMA region has remained unchanged due to several reasons. Increase in outbound work trips from the city core can be identified as a major cause of the stable average work-trip length in the region. Inbound work-trips (suburban to core) usually involve longer travel times compared to outbound work-trips (core to suburban), due to the congestion created by the higher inbound volumes.

The increase in proportion of outbound work-trips is indicated by the increase, between 1971 and 1988, of the proportion of work-trips originating from the Vancouver/Burnaby area with a destination in a suburban zone. This increase can roughly be measured by analyzing morning peak traffic movements across seven bridges which link Vancouver with surrounding zones. The seven bridges analyzed were the Lions Gate, Second Narrows, Port Mann, Patullo, Knight Street, Oak Street, and Arthur Laing bridges. The results which are shown in FIGURES 3.4 and 3.5 indicate that both inbound and outbound traffic volumes have increased. However, the volume of outbound work trips has doubled between 1970 and 1988, while the increase in inbound traffic was about 70 percent.

Another reason for the unchanged travel time for work-trips in the region can be identified as the increase suburban-to-suburban commuting since the early seventies. The travel time required for such trips is usually short because of the lower traffic volumes on inter-suburban streets. Increased inter-suburban work trips can be identified from the GVRD's origin-destination data. For example, for the origin zone of the Coquitlam area, the proportion of work trips with a destination in all zones except Vancouver, New Westminster, and Coquitlam itself has increased. Similar temporal changes can be observed for almost all suburban zones.

In the period between the early seventies and mid-eighties, there had been substantial changes in the transportation infrastructure in the Vancouver metropolitan area, such as the addition of new infrastructure and improvements to the existing ones. Aside from the changes in the commuting pattern of the labour force cited above, such improvements and additions to the transportation network and facilities in the region have contributed to a great extent to the stable average travel time for work-trips during this period. Some of these improvements include:

- The construction of the Cambie Street and Arthur Laing bridges.
- The improvement of traffic operations through the Massey Tunnel.
- The provision of intersection left-turn bays & signals.
- The optimization of signal timing and progression.

The results of the travel time analysis indicated that the success of the "Living Close to Work" strategy cannot be measured by average work-trip travel time because the longer travel times of longer travel distances and increased congestion of inbound trips can be balanced by the shorter travel times of increased outbound and inter-suburban trips. As well, the improvements to the roadway network contribute to the stabilization of average work-trip durations, despite increased travel distances.

3.3 Variations in Origin-Destination Patterns

Another measure of the "Living Close to Work" strategy is the origin-destination patterns of the commuters. The focus of this measure of proximity is the geographical location of employment and residence.

According to this measure, a locational balance between jobs and housing is maintained when a similar proportion of the labour force live and work in the same location over a period of time. The policy is successful if the proportion of labour force living and working in the same location increased between the study years 1971 and 1985.

The results of the analysis of the variations in the internal work-trips of the labour force are shown in FIGURE 3.6. Between 1971 and 1985, the proportion of the labour force living and working in the same zone had decreased for all areas except Richmond. This can be interpreted as a growing locational imbalance between jobs and housing in almost all zones. The decrease was the highest in New Westminster (almost 25 percent), followed by the Maple Ridge area (almost 15 percent). The decrease for the Vancouver area is also substantial (more than 10 percent) and this decrease has great significance in the locational housing to employment balance because Vancouver's employment and population bases are substantially large relative to other zones.

It is important to note that the proportion of internal workers has decreased in all the zones at the urban fringe, despite the high growth rate of employment activities in these areas in the recent past. For example, the percentage increase of employment in the Langleys between 1971 and 1986 was approximately 260 percent, yet its proportion of internal workers decreased quite substantially (around 9 percent) during this period. Richmond is the only zone where the proportion of internal workers increased during the study period. It is evident that a balance between jobs and housing has not been achieved on an intra-zonal basis despite the overall decentralization of jobs to suburban areas.

3.4 Conclusion

This review of transportation trends between the early seventies and the mid-eighties indicates that the average work trip travel time remained approximately the same. However, the average travel time may not be an appropriate measure of the success of the "Living Close to Work" strategy due to the influence of several factors, such as outbound and inter-suburban trips, and road network improvements.

The results of the analysis of internal work trip origin-destination patterns revealed that between 1971 and 1985, the proportion of people living and working in the same zone decreased in all zones except Richmond. This trend indicates that the "Living Close to Work" strategy has been ineffective.

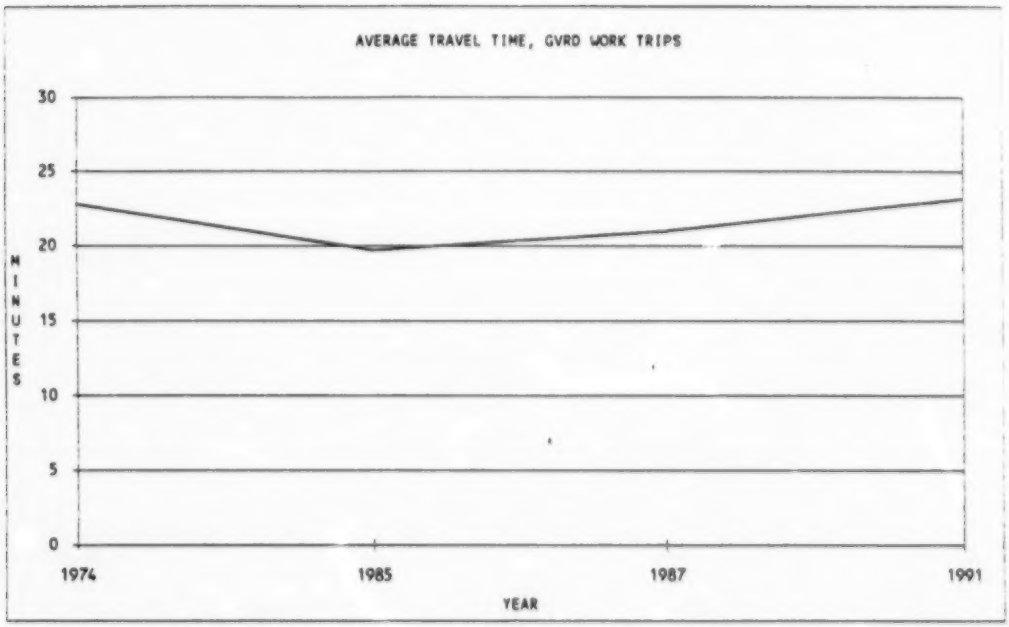

FIGURE 3.1 AVERAGE TRAVEL TIME, GVRD WORK TRIPS

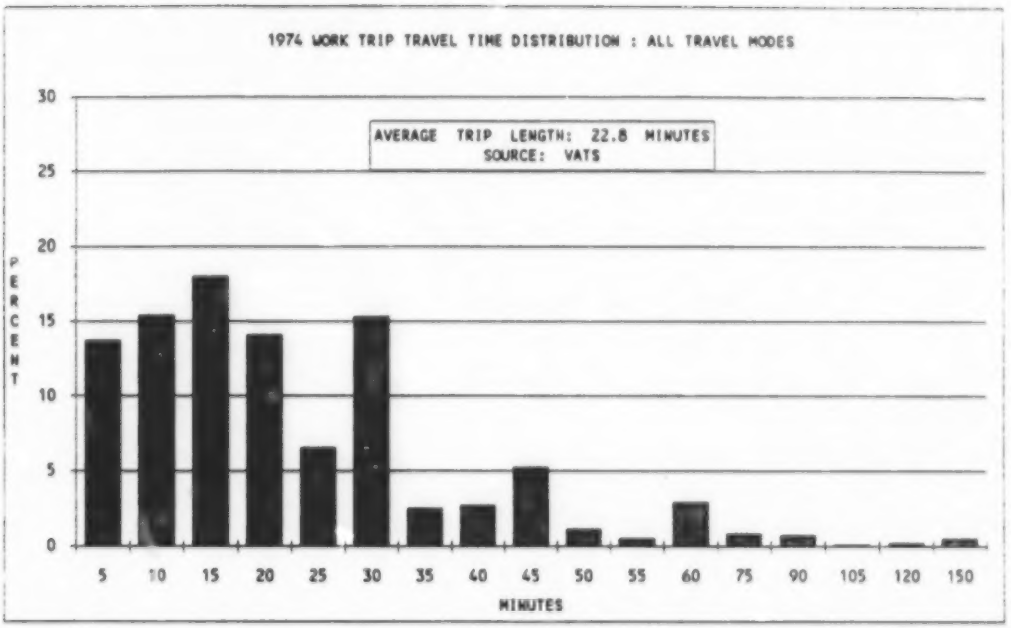

FIGURE 3.2 1974 WORK TRIP TRAVEL TIME DISTRIBUTION, ALL TRAVEL MODES

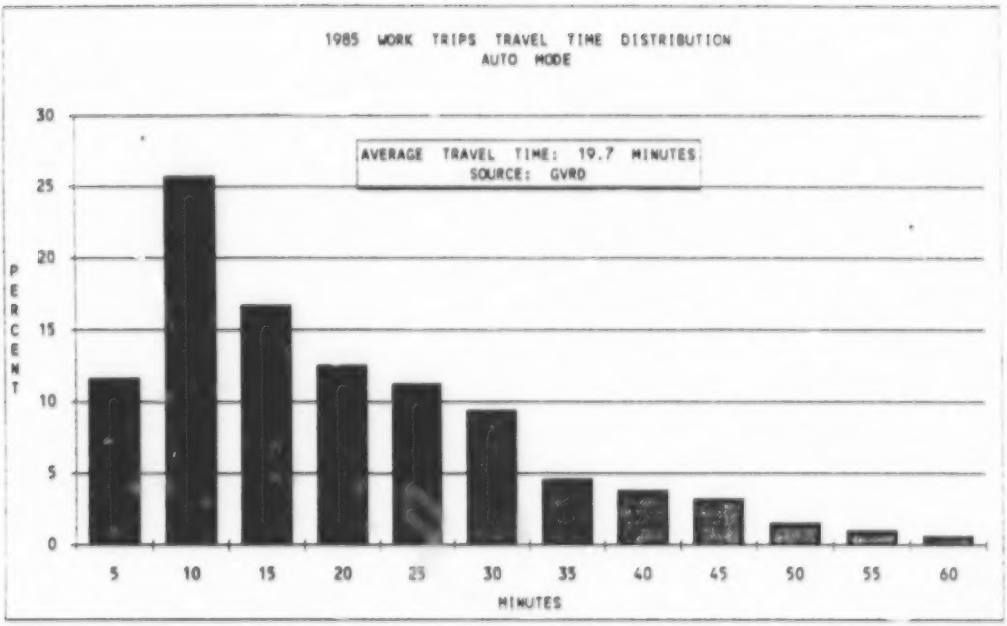

FIGURE 3.3 1985 WORK TRIPS TRAVEL TIME DISTRIBUTION, AUTO MODE

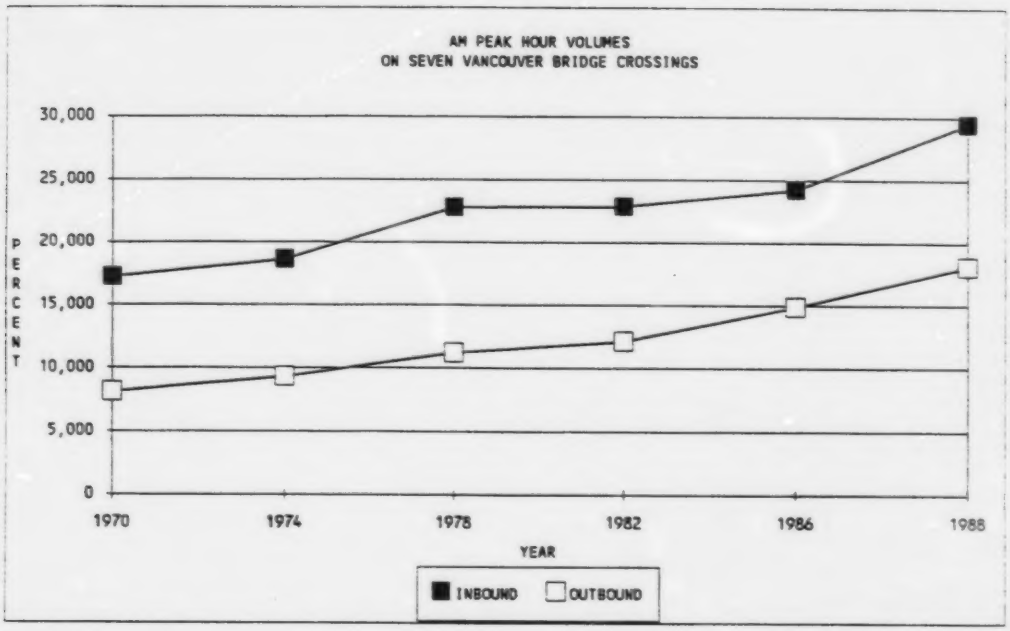

FIGURE 3.4 AM PEAK HOUR VOLUMES ON SEVEN VANCOUVER BRIDGE CROSSINGS

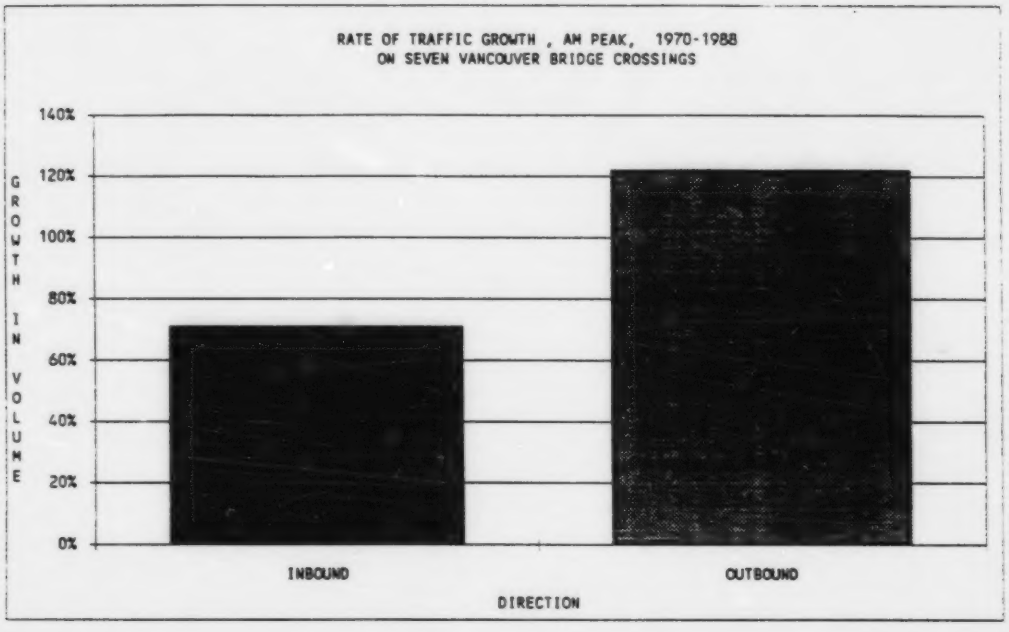

FIGURE 3.5 RATE OF TRAFFIC GROWTH, AM PEAK, 1970–1988 ON SEVEN VANCOUVER BRIDGE CROSSINGS

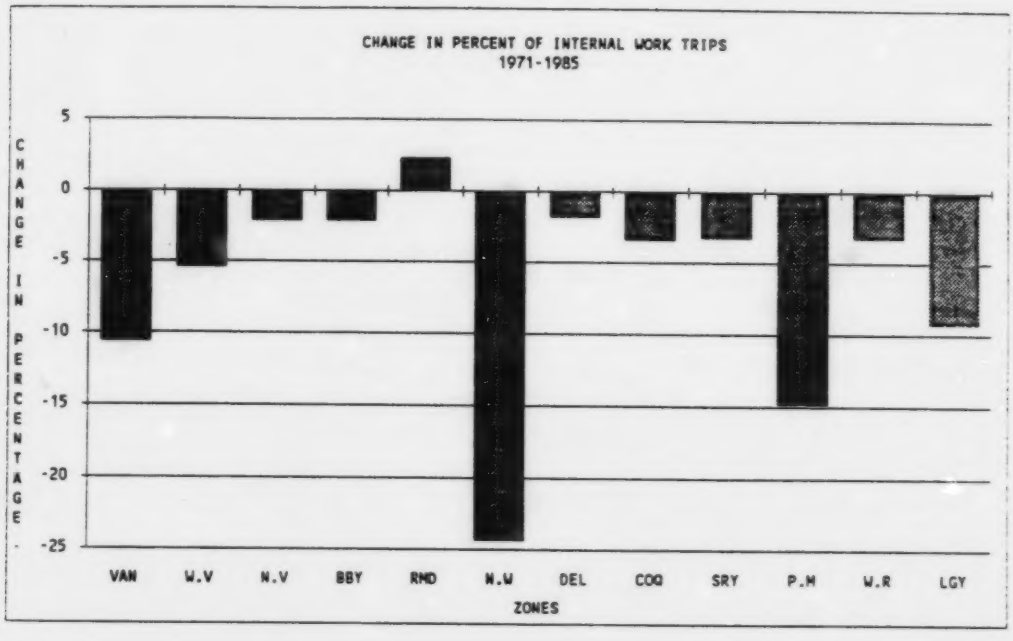

FIGURE 3.6 CHANGE IN PERCENT OF INTERNAL WORK TRIPS 1971–1985

4.0 CHOOSING OUR FUTURE - POLICY CONSIDERATION

4.1 Recent Experience

This section analyzes some of the major elements related to the "Living Close to Work" strategy in the Vancouver metropolitan region. Recent studies of American cities indicated that aside from the volumes of the resident and employed labour force in the origin and destination zones, and the travel impedance between the two zones, there are some other socioeconomic variables that would influence the volume of inter-zonal work-trips or commuters. Such variables could be the household income, housing cost, average household size or the proportion of children in the population either in the origin and the destination zones, or both.

The segregation of jobs and housing in American cities is often attributable to the deteriorating environment in the city core. However, the economic base of the cities has changed substantially since the beginning of the suburbanization movement. While manufacturing industries and goods transport were the most dominant land use in the city core at that time, presently office and commercial uses, which are environmentally more acceptable, predominate. Yet, employment and residential areas in most cities today remain segregated.

Distribution of activity in a metropolitan area today is heterogeneous. While in the traditional society, employment generating activities and residential activities were located side-by-side, the segregated locations of jobs and housing today is one of the major causes of congested transportation conditions in almost all large urban areas.

4.2 Major Factors for the "Living Close to Work" Strategy

Recent studies have demonstrated that the volume of trips between zones is significantly affected by factors other than the components of the basic gravity model. One of these important factors is housing cost at the origin and the destination zones. Aside from housing cost, it has been found that the car-ownership rate and household income in the residential zones also has significant impact on the commuting behaviour of the labour force.

The volume of work-trips between two zones is determined by their pull and push factors. In a simple two zone system, one zone is the place of residence and the other is the place of employment, and a household's decision to locate its residence is influenced by the "push - pull" effect of both zones.

A recent study for the Ottawa-Hull metropolitan region (20) has exhibited that housing costs in the origin and the destination zones (in this case, the origin is the residential zone and the destination is the employment zone) are important factors in determining a household's decision on the location of its dwelling. That is, aside from the components of the basic gravity model (the employed labour force of the employment zone, the resident labour force of the origin zone, and the travel impedance between the two zones), housing costs in the two zones significantly affect the volume of commuters.

It is evident that a high cost of housing in the employment zone deters households from residing in these areas, while lower housing cost in the residential zones attracts the resident labour force. It can thus be stated in terms of the "push-pull" model of residential location (which is essentially an extension of the basic gravity model) that

$$T_{ij} = a_0 + a_1 R_i + a_2 E_j - a_3 H_i + a_4 H_j - a_5 D_{ij}$$

where,

T_{ij} = volume of work-trips or commuters from zone i to zone j.

R_i = resident labour force in zone i (zone of residence).
E_j = employed labour force in zone j (zone of employment).
H_i = cost of housing in zone i.
H_j = cost of housing in zone j.
D_{ij} = some measure of distance separating the zones i and j.
a_0, a_1, a_3, a_4, a_5 are the parameters to be estimated.

4.3 The Housing Component

A. Variations in Housing Cost and Household Income

The variations in household income and housing cost in the Vancouver metropolitan area were reviewed for the period between 1971 to 1986. FIGURE 4.1 shows the locational variations of these variables over this period. The difference between housing value per room and household income was more or less uniform throughout the region in 1971. The areas with relatively smaller differences were the Vancouver, New Westminster and White Rock zones.

A comparison with the 1986 data, however, shows that housing value per room has increased relatively more in areas close to Vancouver's CBD, and that housing cost is higher in areas around the CBD than those farther away. A review of the cost of rent per room indicated that households located farther from the CBD spent relatively less on their housing than those located in areas close to the Vancouver's CBD. The relatively lower cost zones are Delta, the Maple Ridge area, and the Coquitlam area.

For the region as a whole, the difference between average value per room and average household income had increased significantly between the years 1971 and 1986. Those areas farther from the CBD, while having higher incomes have lower cost of housing per room. The proportion of areas where the difference between value per room and household income was low in 1971 (namely, Vancouver, New Westminster and White Rock) continue to show the same pattern. The result of this analysis indicated that the housing situation in the Vancouver area has in fact worsened, as the difference between household income and value per room has reduced in monetary terms.

Higher household income in many areas at the urban fringe, relative to the cost of housing, would imply that households in these areas have more disposable income for commuting to work. Because of the savings in housing cost, these households are able to incur more expense on their commuting cost to work. It is thus possible that travel time to work may be less important for these households. From this viewpoint, living close to work for these households does not probably mean living and working in the same areas. Lower housing costs in the suburban areas therefore result in increased commuting.

B. Affordability of Housing

Since affordability for owning a house in any area is a function of both housing value and income, the ratio of the two is an indicator of this affordability. FIGURE 4.2 presents the ratio of dwelling value per unit and the average household income for all the zones in the study area. The results of the analysis indicated that the ratio has increased in all the zones, except the Maple Ridge area. For the region as a whole, this ratio has increased from 2.69 in 1971 to 3.53 in 1986. This increasing ratio indicated that housing affordability had fallen during the period.

Since dwelling value per unit may vary significantly among locations due to the variations in dwelling size, a better indicator of housing cost is the dwelling value per room, obtained by dividing the average dwelling value by the average number of rooms in that area. The ratio of dwelling value per room and household income, as presented in FIGURE 4.3, show that in eight out of the 12 zones, the ratio had increased between the period 1971 and 1986. The ratio for the entire metropolitan region had increased from 0.52 to 0.62 during this period, substantiating the decrease in housing affordability.

The results of the analysis indicated that the increase in the ratio of housing cost per room and household income had been significantly more in the areas surrounding the central business district of Vancouver. While most of the zones with significant increases in the ratio are close to the CBD, the zones for which the ratio had decreased during this period are located far from it. These zones are the Langleys, Delta, the Maple Ridge area, and the Coquitlam area.

Results of the analysis also reveal that the housing affordability dropped significantly in those areas with the largest share of the regional employment, such as Burnaby (regional employment share of 11 percent), Richmond (9 percent), Surrey (8 percent), and Vancouver (47 percent). On the other hand, the four zones where affordability had increased provided a total of 13 percent of the regional jobs. This trend contradicts the objectives of the "Living Close to Work" strategy.

One of the major reasons for decreasing opportunity for house ownership is evidently the increase in house values as shown in FIGURE 4.4. It appears that the value of housing increased the most in the Vancouver zone (4.5 times), followed by West Vancouver, Richmond and Burnaby. These areas are all close to Vancouver's CBD. However, some of the areas at the fringe (Langley, White Rock and Surrey) also show significant increases in housing value, but their rates are below that for the metropolitan area as a whole.

4.4 Policy Considerations

The results of the analysis indicated that the living close to work decision is influenced by several different socioeconomic variables. Based on these variables, "living close to work" may have different meanings to different people. The GVRD should set out specific objectives for the "Living Close to Work" strategy. Such a strategy needs to consider the following four major elements:

- Transportation cost.
- Employment opportunities.
- Housing prices.
- Labour force distribution.

These four elements are integrally linked as shown in FIGURE 4.5. The GVRD's present "Living Close to Work" strategy consists of the labour force and employment opportunities element only. An effective strategy requires these four major elements to interact in the following manner:

- Affordable housing costs in all regions.
- Decentralization of employment opportunities with compatible labour force distribution.
- A transportation network providing efficient accessibility and mobility at an affordable cost.

The GVRD's policy of encouraging jobs to labour force balance is desirable, as it helps in promoting growth in all regions while also reducing the total distances travelled. However, the policy needs to be broadened to include the four major elements discussed above. The policy considerations are summarized below:

1. A policy aimed at creating a locational balance between employment and residential activities should be based on measurable criteria, such as average travel time between place of residence and place of work, or the geographical distance between the two; for living close to work may have different interpretations for different categories of people because of the variations in their household characteristics.

2. A balance between housing cost and household income is an important consideration for the "Living Close to Work" strategy. A suitable policy to regulate housing cost may be an effective tool for creating this balance but would be difficult to achieve because of free market conditions. However, affordable housing should be encouraged in high employment areas, thereby increasing the opportunities for a jobs to labour force balance.

3. The continued development of a transportation system providing region-wide accessibility and mobility at an affordable cost should be encouraged.

4. Regional districts adjacent to the GVRD should be encouraged to adopt a similar "Living Close to Work" strategy based on the above considerations in order to ensure smooth and efficient interfacing between themselves and the GVRD.

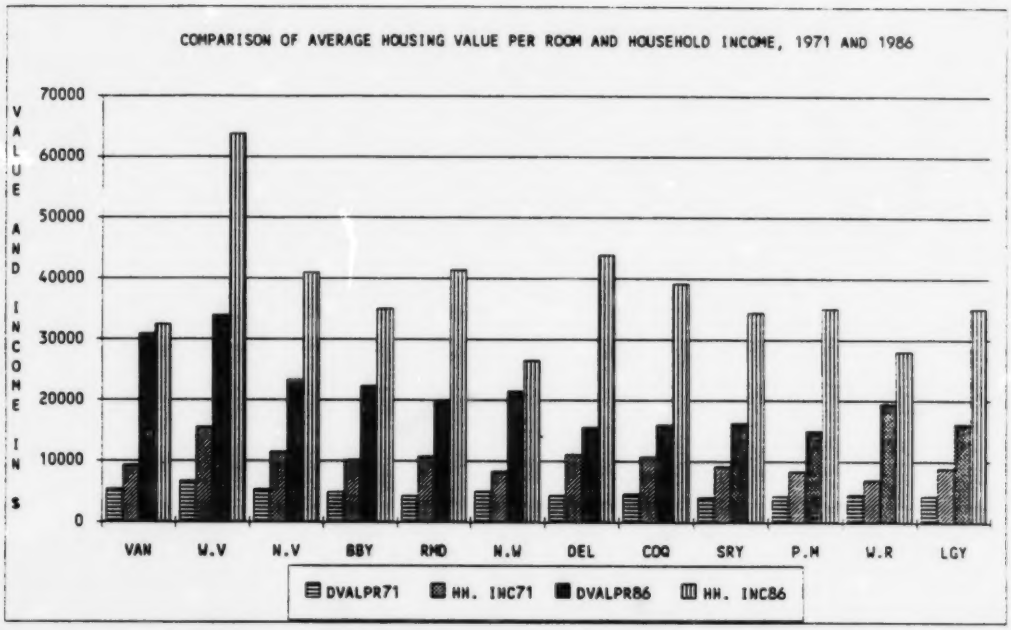

FIGURE 4.1 COMPARISON OF AVERAGE HOUSING VALUE PER ROOM AND HOUSEHOLD INCOME, 1971 AND 1986

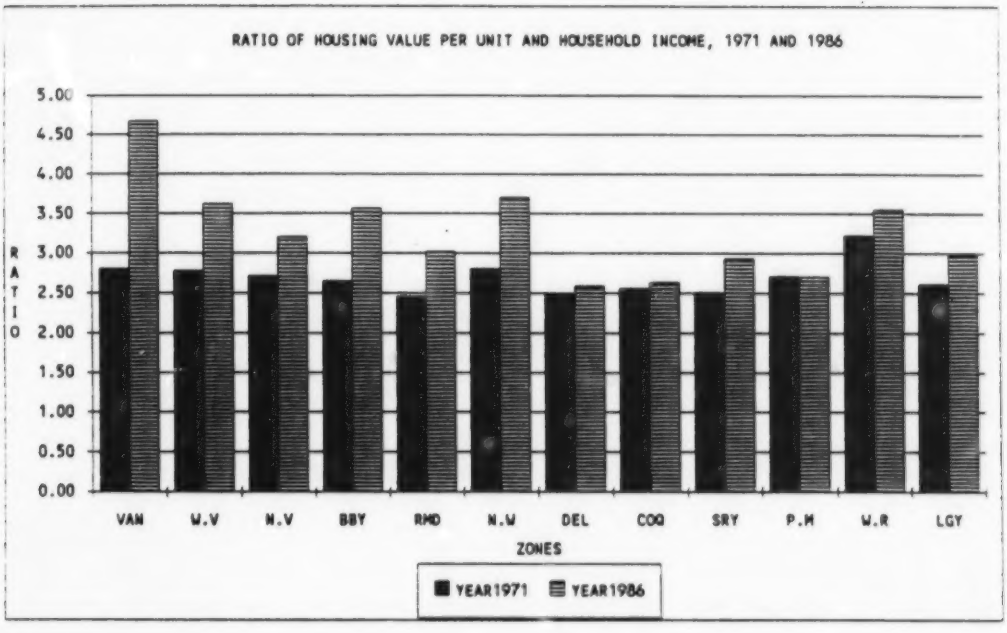

FIGURE 4.2 RATIO OF HOUSING VALUE PER UNIT AND HOUSEHOLD INCOME, 1971 AND 1986

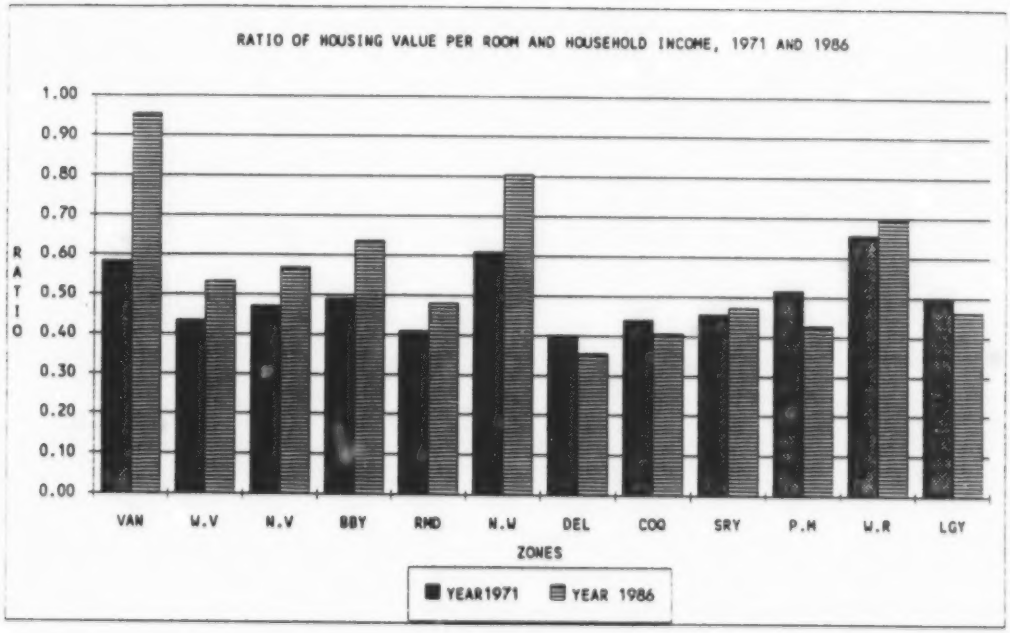

FIGURE 4.3 RATIO OF HOUSING VALUE PER ROOM AND HOUSEHOLD INCOME, 1971 AND 1986

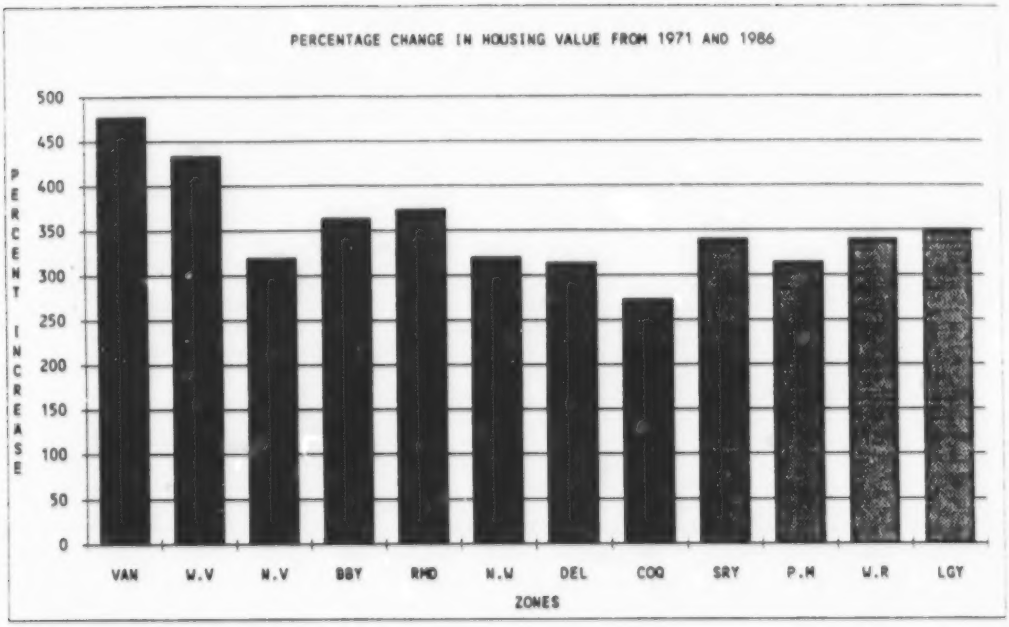

FIGURE 4.4 PERCENTAGE CHANGE IN HOUSING VALUE FROM 1971 TO 1986

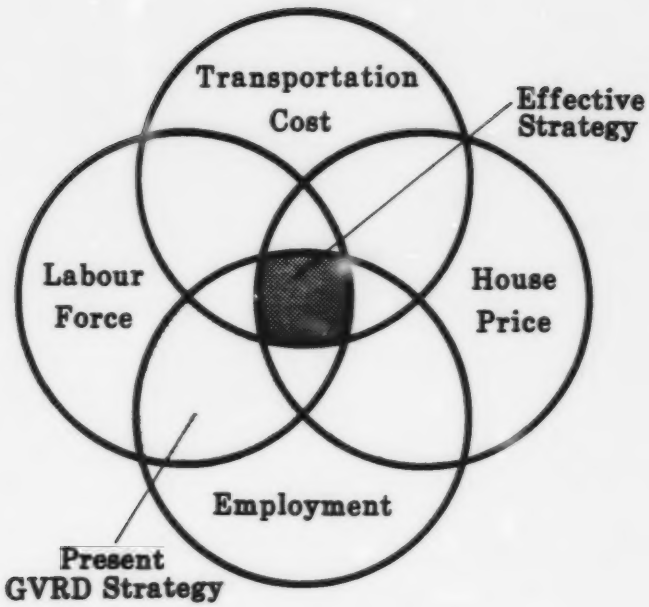

FIGURE 4.5 MAJOR ELEMENTS OF THE "LIVING CLOSE TO WORK" STRATEGY

APPENDIX I

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APPENDIX II

FEMALE LABOUR FORCE PARTICIPATION RATE: 1971 and 1986
VANCOUVER/UEL ZONE

1971 FEMALE LABOUR FORCE PARTICIPATION RATE = 47.57%
1986 FEMALE LABOUR FORCE PARTICIPATION RATE = 60.10%
NUMBER OF FEMALES IN LABOUR FORCE IN 1971 = 84,349
NUMBER OF FEMALES IN LABOUR FORCE IN 1986 = 112,750

1. The increase in the Female Participation Rate between 1971-1986 was 26.3%.

2. The absolute increase of women in the labour force was 28,401.

3. The actual increase of women in the labour force during this period resulting from the increase in the female participation rate of 26.3% is 22,184 women; a total of 106,533 women in the labour force in 1986.

4. Of the total increase in female labour force, 78% could be attributed to the increase in female participation rate. The remaining 22% could be attributed to demographic changes.

5. Dividing the increase in the number of females in the labour force resulting from the increased participation rate by the absolute total increase in Vancouver's resident labour force between 1971 and 1986 reveals that 57.4% of the total increase in the labour force can be attributed to the increase of working females.